

# FUEL CELL EXPERIENCE MORENO VALLEY REGIONAL WATER RECLAMATION FACILITY

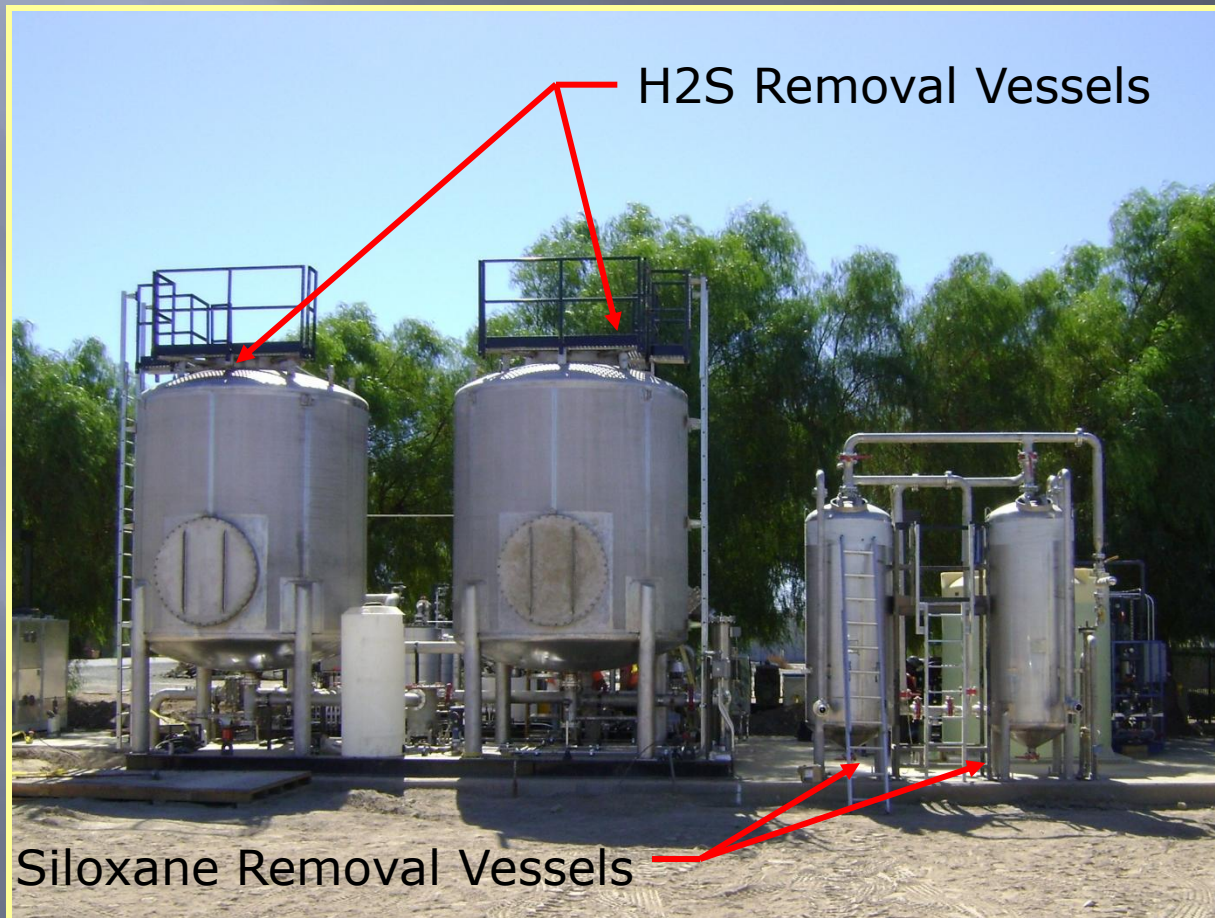


Presented by:  
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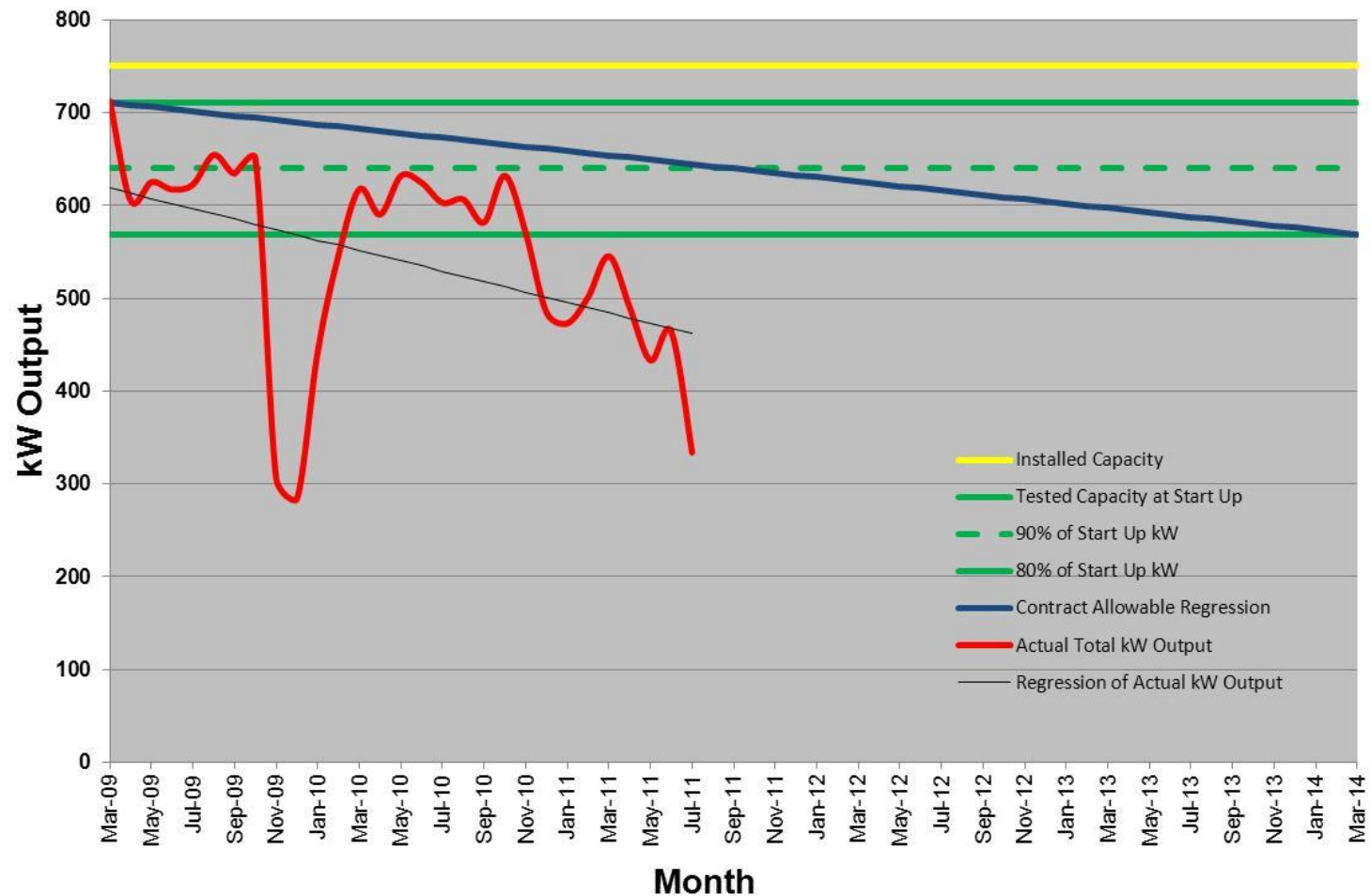
# MVRWRF Fuel Cell Project



# H<sub>2</sub>S and Siloxane Removal Vessels



# Fuel Cell Performance





# Operational Challenges

- ▣ **Complex – Hard to Operate**
- ▣ **Fuel Pre-Treatment Critical**
- ▣ **Reliable RO Water Supply**
- ▣ **Variable Digester Gas Supply**
- ▣ **Affect of Heating/Cooling Cycles**
- ▣ **Stack Life & Output**

# Economics

- ▣ **Total Project Costs**                      **\$9,568,460**
- ▣ **SGIP Rebate**                                      **(\$3,375,000)**
- ▣ **EMWD “Out of Pocket”**                      **\$6,193,460**
- ▣ **Original Estimated Payback**      **~~8 Years~~**
- ▣ **Revised Estimate Payback**              **>10 Years**

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# Annual Operating Costs

RO Skid Maintenance Agreement	\$11,928
Gas Pre-treatment System Service Agreement	\$237,344
Fuel Cell Service Agreement	\$231,958
Supplemental Natural Gas	\$105,000
Syrup Hauling	\$70,000
<b>TOTAL COST/YR</b>	<b>\$656,230</b>



# Questions?



# Moreno Valley RWRf

## Existing Plant

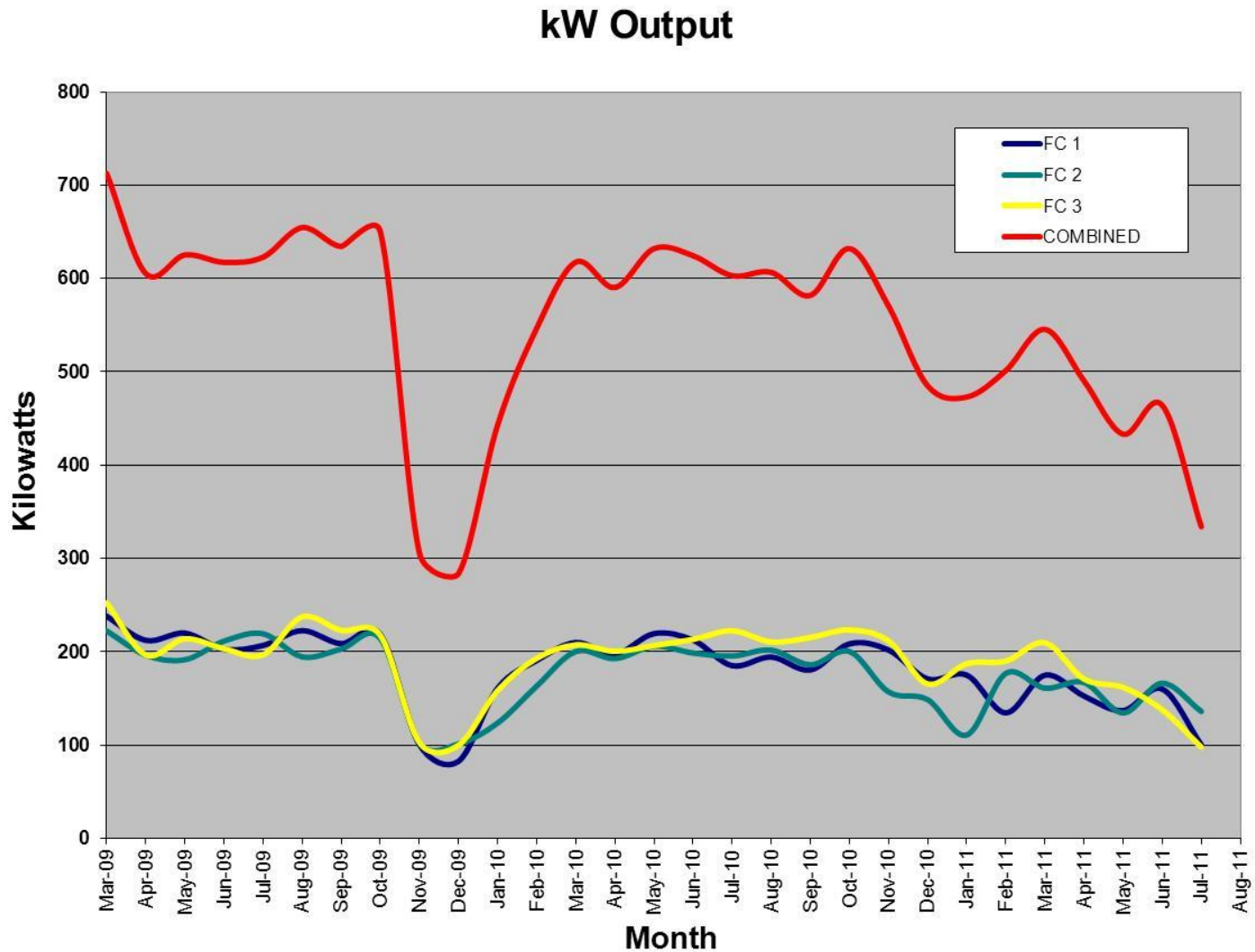
- 14 mgd WWTP
- 5 anaerobic digesters

## Expansion

- 16 mgd/18 mgd solids capacity
- 1 acid phase anaerobic digester
- 4 methane digesters



# Fuel Cell Performance



# Fuel Cell Benefits

- ▣ **High electrical efficiency**
  - Fuel cell 47%
  - Engine 34%
  - Microturbine 29%
  
- ▣ **Can recover an additional 20+% of input fuel energy as heat from exhaust**
  
- ▣ **No combustion – virtually no emissions:**
  - 0.02 lb/MWh NO<sub>x</sub>
  - 0.001 lb/MWh SO<sub>x</sub>
  - 0.10 lb/MWh CO



# Fuel Cell System Features

- ▣ Includes natural gas blending to supplement digester gas as needed
- ▣ Provided with load banks to allow the fuel cells to operate at rated capacity during outages or disruptions
- ▣ Furnished with exhaust heat recovery unit to recover 750 degree exhaust as 180 degree hot water to heat digesters